MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER II, 2019/2020

PMT0301 – MATHEMATICS III

(Foundation in Information Technology)

06 MARCH 2020
9.00 a.m. – 11.00a.m.
(2 Hours)

INSTRUCTIONS TO STUDENT

1. This question paper consists of **FOUR** printed pages, excluding cover page, formula and statistical table.

2. Answer **ALL FOUR** questions. The distribution of the marks for each question is given.

3. Please write all your answers in the **Answer Booklet**.

4. All necessary working steps **MUST** be shown to obtain maximum marks.

PMT0301: FORMULAE

$$\mathbf{u}\cdot\mathbf{v}=|\mathbf{u}||\mathbf{v}|\cos\theta$$
$$|\mathbf{u}\times\mathbf{v}|=|\mathbf{u}||\mathbf{v}|\sin\theta$$

$$A^{-1}=\frac{1}{|A|}\text{adj } A$$

$$T_n=a+(n-1)d \qquad S_n=\frac{n}{2}\left[2a+(n-1)d\right]$$

$$T_n=ar^{n-1} \qquad S_n=\frac{a(1-r^n)}{1-r} \qquad S_\infty=\frac{a}{1-r}$$

$$\mu=\frac{\sum x}{N} \quad ; \quad \bar{x}=\frac{\sum x}{n}=\frac{\sum mf}{n}$$

$$\sigma^2=\frac{\sum x^2-\frac{(\sum x)^2}{N}}{N}=\frac{\sum m^2 f-\frac{(\sum mf)^2}{N}}{N}$$

$$s^2=\frac{\sum x^2-\frac{(\sum x)^2}{n}}{n-1}=\frac{\sum m^2 f-\frac{(\sum mf)^2}{n}}{n-1}$$

Additive Rule : $P(A\cup B)=P(A)+P(B)-P(A\cap B)$

Complementary Events : $P(A)+P(A')=1$

Conditional Probability : $P(B/A)=\frac{P(A\cap B)}{P(A)}$, $P(A)>0$

Multiplicative Rule : $P(A\cap B)=P(B/A)P(A)$

Independent Events : $P(A\cap B)=P(A)P(B)$

$$P(X=x)=\binom{n}{x}p^x q^{n-x} \quad , \quad x=0,1,2,3,\ldots,n \qquad P(X=x)=\frac{\lambda^x e^{-\lambda}}{x!} \quad , \quad x=0,1,2,3,\ldots$$

$$Z=\frac{X-\mu}{\sigma} \qquad {}^nP_r=\frac{n!}{(n-r)!} \qquad {}^nC_r=\frac{n!}{(n-r)!r!}$$

QUESTION 1 [15 MARKS]

a) Given $\mathbf{u} = 2\mathbf{i} + 4\mathbf{j} + \mathbf{k}$ and $\mathbf{v} = \mathbf{i} + \mathbf{j} + \mathbf{k}$.
Find the angle between the two vectors. [3 marks]

b) Find an equation of a plane that passes through point $(2,1,3)$ is parallel to the plane $x + 3y - z = 4$. Give your final answer in the form of $ax + by + cz = d$.
[2 marks]

c) Find a vector that is perpendicular to both $\mathbf{u} = \langle -5,1,-1 \rangle$ and $\mathbf{v} = \langle 3,6,-2 \rangle$.
[2 marks]

d) Matrix A is given by $A = \begin{bmatrix} 2 & -1 & 2 \\ 0 & 3 & 1 \\ 1 & 2 & 3 \end{bmatrix}$.

i) Find cofactor matrix and adjoint matrix of A.
ii) Use first row to evaluate $|A|$.
iii) Find A^{-1}.
iv) Use your result from part (i-iii) above to solve the following simultaneous equations.

$$2x - y + 2z = 7$$
$$3y + z = -1$$
$$x + 2y + 3z = 5$$

[8 marks]

Continued...

QUESTION 2 [15 MARKS]

a) The first four terms of an arithmetic sequence are p, 9, q and 17.
Find the values of p and q.

[2 marks]

b) In a geometric sequence, the first term is 625 and the fifth term is 81. Calculate

i) the common ratio,
ii) the sum to infinity of the sequence.

[2 marks]

c) Find the coefficient of the term that contains x^{15} in the expansion of $\left(x+x^2\right)^{10}$.

[3 marks]

d) The mean of 8, 10, 26, 30, 45, 32, x, y is 25 where x and y are constants.

i) If the mode is 26, find the values of x and y where $x > y$.
ii) Based on your answer from part (i), find the median.

[2 marks]

e) Below is the frequency distribution table for the height (in meter) by a random sample of 58 coconut trees along a beach.

Height (m)	Number of trees
1 – 3	4
4 – 6	6
7 – 9	8
10 – 12	12
13 – 15	18
16 – 18	10

Copy the above table in your answer booklet and add necessary columns.

i) What is the mode class?
ii) Calculate the mean. Give your answer correct to 1 decimal place.
iii) Calculate the standard deviation. Give your answer correct to 2 decimal places.

[6 marks]

Continued...

QUESTION 3 [10 MARKS]

a) Amanda has five space left for stamps in a stamp book and she has eight different stamps. How many different combinations are there?

[1 mark]

b) There are 10 students out of whom six are females.
How many arrangements are there if

i) they are arranged in a row?
ii) they are arranged in a circle?
iii) males always sit on one side and females on the other side in a row?

[3 marks]

c) Given two independent events A and B, where $P(A)=0.1$ and $P(B)=0.3$.

i) State a condition for the two events A and B to be independent.
ii) Find $P(A\cap B)$. Are the events A and B mutually exclusive?
iii) Find $P(B'/A')$.

[3 marks]

d) A survey was made among 100 MMU graduates who report on their employment. The numbers are shown in the following table:

	Employed, E	Unemployed, U
Male, M	10	40
Female, F	30	20

If a graduate is chosen randomly,

i) calculate the probability that the graduate is a male and unemployed.
ii) If the graduate is a female, find the probability that she is unemployed.
iii) Calculate the probability that the graduate chosen is a female or employed.

[3 marks]

Continued...

QUESTION 4 [10 MARKS]

a) In a school, 70% of the teachers are female. If 10 teachers are randomly chosen,

i) find the probability that at least nine of them are female.
ii) Calculate the mean and the standard deviation of choosing female teachers.

[4 marks]

b) Suppose that on average, a telephonist receives 3 calls in a 2-minute period.

i) Find the probability not more than 2 calls being received in a 2-minute period.
ii) Find the percentage of 5 calls received in a 1-minute period.

[3 marks]

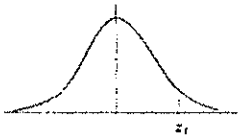
c) The lifespan of a type of bulb is normally distributed with mean 600 hours and standard deviation 40 hours.

i) If a bulb is chosen at random, find the probability that the bulb has lifespan more than 580 hours.
ii) If 120 from 600 bulbs has lifespan more than m hours, calculate the value of m.

[3 marks]

End of Page.

Standard Normal Distribution



$$p(z \le z_1) = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{z_1} e^{-\frac{1}{2}z^2} dz$$

The Normal Distribution Function

x	Φ(X)	x	Φ(X)	x	Φ(X)	x	Φ(X)
0.00	0.5000	0.50	0.6915	1.00	0.8413	1.50	0.9332
0.01	0.5040	0.51	0.6950	1.01	0.8438	1.51	0.9345
0.02	0.5080	0.52	0.6985	1.02	0.8461	1.52	0.9357
0.03	0.5120	0.53	0.7019	1.03	0.8485	1.53	0.9370
0.04	0.5160	0.54	0.7054	1.04	0.8508	1.54	0.9382
0.05	0.5199	0.55	0.7088	1.05	0.8531	1.55	0.9394
0.06	0.5239	0.56	0.7123	1.06	0.8554	1.56	0.9406
0.07	0.5279	0.57	0.7157	1.07	0.8577	1.57	0.9418
0.08	0.5319	0.58	0.7190	1.08	0.8599	1.58	0.9429
0.09	0.5359	0.59	0.7224	1.09	0.8621	1.59	0.9441
0.10	0.5398	0.60	0.7257	1.10	0.8643	1.60	0.9452
0.11	0.5438	0.61	0.7291	1.11	0.8665	1.61	0.9463
0.12	0.5478	0.62	0.7324	1.12	0.8686	1.62	0.9474
0.13	0.5517	0.63	0.7357	1.13	0.8708	1.63	0.9484
0.14	0.5557	0.64	0.7389	1.14	0.8729	1.64	0.9495
0.15	0.5596	0.65	0.7422	1.15	0.8749	1.65	0.9505
0.16	0.5636	0.66	0.7454	1.16	0.8770	1.66	0.9515
0.17	0.5675	0.67	0.7486	1.17	0.8790	1.67	0.9525
0.18	0.5714	0.68	0.7517	1.18	0.8810	1.68	0.9535
0.19	0.5753	0.69	0.7549	1.19	0.8830	1.69	0.9545
0.20	0.5793	0.70	0.7580	1.20	0.8849	1.70	0.9554
0.21	0.5832	0.71	0.7611	1.21	0.8869	1.71	0.9564
0.22	0.5871	0.72	0.7642	1.22	0.8888	1.72	0.9573
0.23	0.5910	0.73	0.7673	1.23	0.8907	1.73	0.9582
0.24	0.5948	0.74	0.7704	1.24	0.8925	1.74	0.9591
0.25	0.5987	0.75	0.7734	1.25	0.8944	1.75	0.9599
0.26	0.6026	0.76	0.7764	1.26	0.8962	1.76	0.9608
0.27	0.6064	0.77	0.7794	1.27	0.8980	1.77	0.9616
0.28	0.6103	0.78	0.7823	1.28	0.8997	1.78	0.9625
0.29	0.6141	0.79	0.7852	1.29	0.9015	1.79	0.9633
0.30	0.6179	0.80	0.7881	1.30	0.9032	1.80	0.9641
0.31	0.6217	0.81	0.7910	1.31	0.9049	1.81	0.9649
0.32	0.6255	0.82	0.7939	1.32	0.9066	1.82	0.9656
0.33	0.6293	0.83	0.7967	1.33	0.9082	1.83	0.9664
0.34	0.6331	0.84	0.7995	1.34	0.9099	1.84	0.9671
0.35	0.6368	0.85	0.8023	1.35	0.9115	1.85	0.9678
0.36	0.6406	0.86	0.8051	1.36	0.9131	1.86	0.9686
0.37	0.6443	0.87	0.8078	1.37	0.9147	1.87	0.9693
0.38	0.6480	0.88	0.8106	1.38	0.9162	1.88	0.9699
0.39	0.6517	0.89	0.8133	1.39	0.9177	1.89	0.9706
0.40	0.6554	0.90	0.8159	1.40	0.9192	1.90	0.9713
0.41	0.6591	0.91	0.8186	1.41	0.9207	1.91	0.9719
0.42	0.6628	0.92	0.8212	1.42	0.9222	1.92	0.9726
0.43	0.6664	0.93	0.8238	1.43	0.9236	1.93	0.9732
0.44	0.6700	0.94	0.8264	1.44	0.9251	1.94	0.9738
0.45	0.6736	0.95	0.8289	1.45	0.9265	1.95	0.9744
0.46	0.6772	0.96	0.8315	1.46	0.9279	1.96	0.9750
0.47	0.6808	0.97	0.8340	1.47	0.9292	1.97	0.9756
0.48	0.6844	0.98	0.8365	1.48	0.9306	1.98	0.9761
0.49	0.6879	0.99	0.8389	1.49	0.9319	1.99	0.9767
0.50	0.6915	1.00	0.8413	1.50	0.9332	2.00	0.9772

x	Φ(X)	x	Φ(X)	x	Φ(X)	x	Φ(X)
2.00	0.97725	2.50	0.99379	3.00	0.99865	3.50	0.99977
2.01	0.97778	2.51	0.99396	3.01	0.99869	3.51	0.99978
2.02	0.97831	2.52	0.99413	3.02	0.99874	3.52	0.99978
2.03	0.97882	2.53	0.99430	3.03	0.99878	3.53	0.99979
2.04	0.97932	2.54	0.99446	3.04	0.99882	3.54	0.99980
2.05	0.97982	2.55	0.99461	3.05	0.99886	3.55	0.99981
2.06	0.98030	2.56	0.99477	3.06	0.99889	3.56	0.99981
2.07	0.98077	2.57	0.99492	3.07	0.99893	3.57	0.99982
2.08	0.98124	2.58	0.99506	3.08	0.99896	3.58	0.99983
2.09	0.98169	2.59	0.99520	3.09	0.99900	3.59	0.99983
2.10	0.98214	2.60	0.99534	3.10	0.99903	3.60	0.99984
2.11	0.98257	2.61	0.99547	3.11	0.99906	3.61	0.99985
2.12	0.98300	2.62	0.99560	3.12	0.99910	3.62	0.99985
2.13	0.98341	2.63	0.99573	3.13	0.99913	3.63	0.99986
2.14	0.98382	2.64	0.99585	3.14	0.99916	3.64	0.99986
2.15	0.98422	2.65	0.99598	3.15	0.99918	3.65	0.99987
2.16	0.98461	2.66	0.99609	3.16	0.99921	3.66	0.99987
2.17	0.98500	2.67	0.99621	3.17	0.99924	3.67	0.99988
2.18	0.98537	2.68	0.99632	3.18	0.99926	3.68	0.99988
2.19	0.98574	2.69	0.99643	3.19	0.99929	3.69	0.99989
2.20	0.98610	2.70	0.99653	3.20	0.99931	3.70	0.99989
2.21	0.98645	2.71	0.99664	3.21	0.99934	3.71	0.99990
2.22	0.98679	2.72	0.99674	3.22	0.99936	3.72	0.99990
2.23	0.98713	2.73	0.99683	3.23	0.99938	3.73	0.99990
2.24	0.98745	2.74	0.99693	3.24	0.99940	3.74	0.99991
2.25	0.98778	2.75	0.99702	3.25	0.99942	3.75	0.99991
2.26	0.98809	2.76	0.99711	3.26	0.99944	3.76	0.99992
2.27	0.98840	2.77	0.99720	3.27	0.99946	3.77	0.99992
2.28	0.98870	2.78	0.99728	3.28	0.99948	3.78	0.99992
2.29	0.98899	2.79	0.99736	3.29	0.99950	3.79	0.99992
2.30	0.98928	2.80	0.99744	3.30	0.99952	3.80	0.99993
2.31	0.98956	2.81	0.99752	3.31	0.99953	3.81	0.99993
2.32	0.98983	2.82	0.99760	3.32	0.99955	3.82	0.99993
2.33	0.99010	2.83	0.99767	3.33	0.99957	3.83	0.99994
2.34	0.99036	2.84	0.99774	3.34	0.99958	3.84	0.99994
2.35	0.99061	2.85	0.99781	3.35	0.99960	3.85	0.99994
2.36	0.99086	2.86	0.99788	3.36	0.99961	3.86	0.99994
2.37	0.99111	2.87	0.99795	3.37	0.99962	3.87	0.99995
2.38	0.99134	2.88	0.99801	3.38	0.99964	3.88	0.99995
2.39	0.99158	2.89	0.99807	3.39	0.99965	3.89	0.99995
2.40	0.99180	2.90	0.99813	3.40	0.99966	3.90	0.99995
2.41	0.99202	2.91	0.99819	3.41	0.99968	3.91	0.99995
2.42	0.99224	2.92	0.99825	3.42	0.99969	3.92	0.99996
2.43	0.99245	2.93	0.99831	3.43	0.99970	3.93	0.99996
2.44	0.99266	2.94	0.99836	3.44	0.99971	3.94	0.99996
2.45	0.99286	2.95	0.99841	3.45	0.99972	3.95	0.99996
2.46	0.99305	2.96	0.99846	3.46	0.99973	3.96	0.99996
2.47	0.99324	2.97	0.99851	3.47	0.99974	3.97	0.99996
2.48	0.99343	2.98	0.99856	3.48	0.99975	3.98	0.99997
2.49	0.99361	2.99	0.99861	3.49	0.99976	3.99	0.99997
2.50	0.99379	3.00	0.99865	3.50	0.99977	4.00	0.99997